Three-Step Nitride Etching Process for Better Critical Dimension and Better Vertical Sidewall Profile

ABSTRACT

This invention describes a three-step process for etching a layer of silicon nitride over a thin layer of silicon dioxide on a semicondutor substrate for producing silicon nitride pattern with nearly vertical sidewalls, very small critical dimension bias and no trenching in the silicon dioxide, comprising a first step of a highly anisotropic etch process with a high etch rate, achieved by adding CHF_3 to the gaseous mixture of SF_6 and He, carried out at a relatively high power and low pressure, used to etch the bulk of the silicon nitride layer, a second step of lower ethc anisotropy and etch rate, achieved by replacing CHF_3 with HBr, carried out at higher pressure and lower power, used to etch out the remainder of the nitride layer with a small over-etch beyond the end point, a third step of high Si_3N_4/SiO_2 etch selectivity, achieved by adding an oxidant to the reactive gas mixture, used to remove any remaining silicon nitride residues.

(FIGURE 5 IS SUGGESTED FOR PUBLICATION)